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(58) Field of search
B5A
Selected US specifications from IPC sub-class B29C

(54) Automatic variation of extrusion cross section independence on length thereof

(57) In the method for the continuous production of an extruded profile having cross-sectional dimensions which vary with its length, effected with the use of an extrusion head provided with at least one movable member which is adapted to modify the section of the extrusion orifice, data and/or information representing the law of variation of the position of the movable member in dependence on the length of the extruded profile according to a predetermined model of the profile to be produced are stored on a recording medium, an operating and control unit being provided for reading information and/or data from the recording medium and for causing the controlled displacement of the movable member of the extrusion head according to the law read from the medium, the deviations from the desired value of at least one parameter of the shape of the section of the profile produced by the extrusion head being monitored and adjustment means associated with the control and operating unit being operated in dependence on the deviations detected to alter from outside the law of variation of the position of the movable member so as to minimise the deviations.

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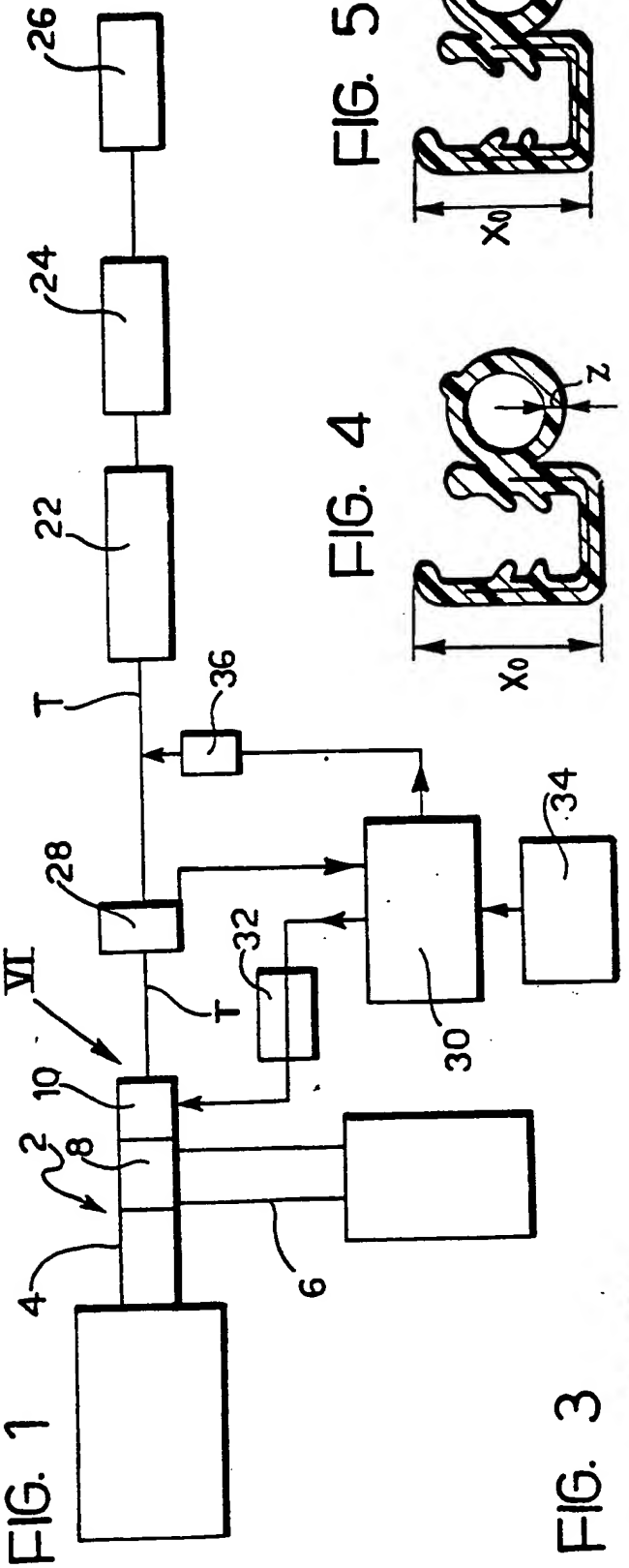

FIG. 1

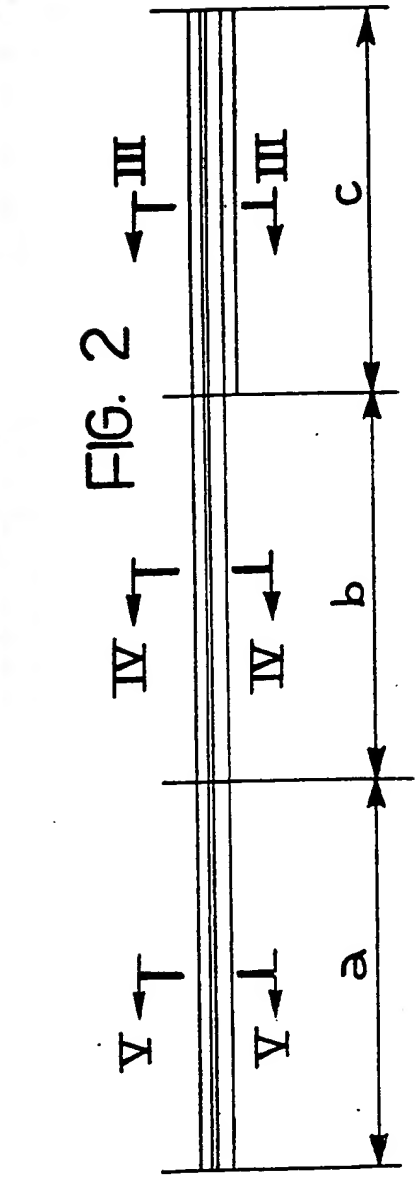

FIG. 2

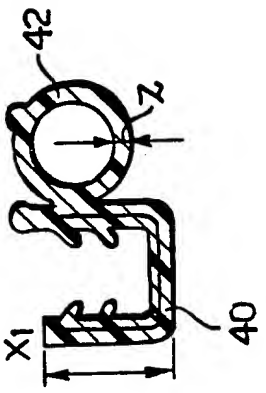

FIG. 3

FIG. 4

FIG. 5

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FIG. 6

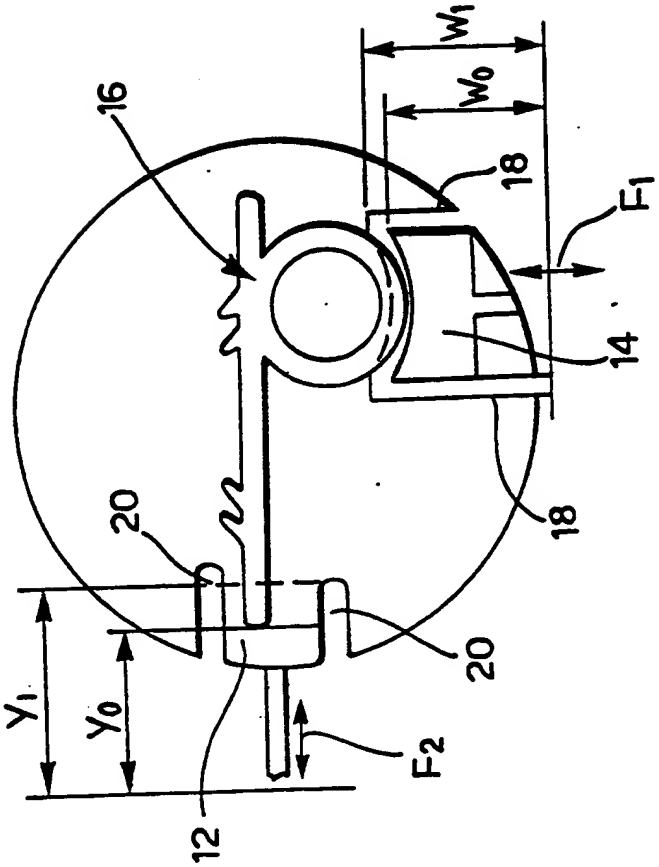
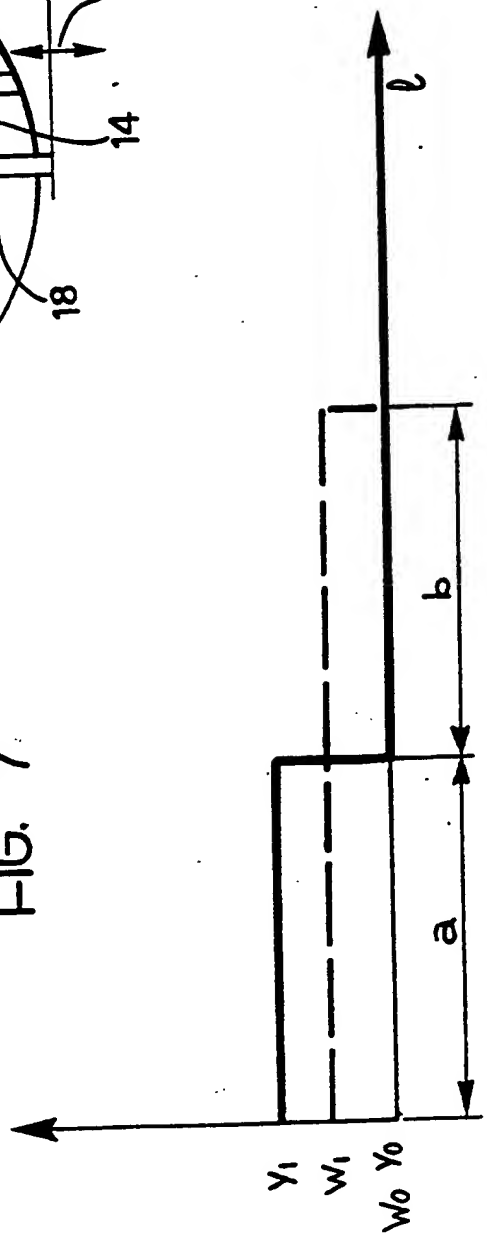


FIG. 7



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A METHOD FOR THE CONTINUOUS PRODUCTION OF AN EXTRUDED PROFILE HAVING CROSS-SECTIONAL DIMENSIONS WHICH VARY WITH THE LENGTH OF THE PROFILE

The present invention relates to a method for the continuous production of an extruded profile having a cross-section which varies with its length, particularly a weather strip for the bodywork of motor vehicles, with the use of extrusion equipment including an extrusion head provided with at least one movable member for modifying the section of the extrusion orifice to a degree which can be varied in dependence on its position.

In known methods of the aforementioned type, it is particularly difficult cosntantly to obtain an extruded profile with the desired and predetermined characteristics of shape. In fact, the effective dimensions of the extruded and subsequently vulcanised profile depend on a large number of variables, such as, for example, the composition of the mixture of the material used and the vulcanising conditions the behaviour of which is often difficult to predict beforehand.

The primary object of the present invention is to achieve a particularly simple method which enables an extruded profile corresponding to the desired characteristics to be obtained, thus minimising production rejects.

For this purpose, the subject of the present invention is a method characterised in that it includes the steps of:

storing on a machine-readable recording medium data and/or information representing the law of variation of the position of the at least one movable member of the

extrusion head in dependence on the length of the extruded profile, according to a predetermined model of the profile to be produced;

providing a control and operating unit for reading information and/or data from the recording medium and causing the controlled displacement of the at least one movable member of the extrusion head according to the law read from the recording medium, the unit being provided with manual adjustment and operating means for eanbling the law taken from the recording medium to be altered from the outside;

monitoring the deviations from the desired value of at least one parameter of the shape of the section of the profile produced by the extrusion head, and

operating the adjustment means in dependence on the deviations detected so as to minimise the deviations (during the production stage).

Further characteristics and advantages of the method according to the invention will become clear from the detailed description which follows with reference to the appended drawings, provided by way of non-limiting example, in which:

Figure 1 shows schematically equipment for carrying out the method,

Figure 2 is a front view of a weather strip for motor vehicles obtainable by means of the method,

Figures 3, 4 and 5 are cross-sections taken on the lines III-III, IV-IV and V-V of Figure 2, respectively,

Figure 6 is a front view of an extrusion die which forms part of the equipment illustrated in Figure 1,

taken on the arrow VI of Figure 1, and

Figure 7 is a graph which shows the law of variation of two dimensional parameters of a weather strip.

With reference to the drawings, extrusion equipment is generally indicated 2 in Figure 1 and comprises two extrusion pipes 4 and 6, each of which supplies a flow of material to be extruded to an extrusion head 8. For example, the first extrusion pipe may supply a solid elastomeric material and the second pipe may supply an elastomeric material containing an expanding agent. An extrusion die 10 is fixed to the extrusion head 8 and is provided with one or more movable members or obturator blades 12, 14 (Figure 6) for varying the shape of an extrusion orifice 16. Each obturator member is mounted on a pair of guides 18 and 20 and is movable between these guides in the directions indicated F1 and F2 respectively.

An extrusion emerging from the extrusion orifice is indicated T and is supplied in succession to one or more vulcanising stations including a microwave oven and one or more hot air ovens, subsequently to a cutting station 24, and then to a collecting station 26.

An encoder of known type, for example, of rotary type, is indicated 28 and is adapted to provide an electrical signal indicative of the length of the extrusion T. The signal provided by the encoder is supplied to an input of a control and operating unit 30 which controls the functioning of an operating motor 32 which is adapted to cause the controlled displacement of the movable obturator members 12 and 14.

By way of example, a weather strip which is to be produced by means of the method according to the invention is shown in Figures 2 to 5. This weather strip comprises an attachment profile 40 having a U-shaped section of solid elastomeric material with a bulb 42 of cellular material. The weather strip has successive adjacent sections with differently-shaped cross-sections. In particular, with reference to the normal section illustrated in Figure 4, having a flange height x_o and a bulb thickness dimension z_o, the cross-sections of Figures 3 and 5 differ in the height x_1 of the flange and in the dimension z_1 of the bulb respectively. Respective positions of the obturator 20 correspond to the dimensions x_o and x_1 of the flange and assume values y_o and y_1 with respect to a reference system relating to the axis along which the obturator is movable. Similarly, respective positions w_o and w_1 of the obturator 22 correspond to the dimensions z_o and z_1 of the thickness of the bulb relative to a fixed reference.

In order to carry out the method according to the invention, data and information representing the law by which the positions of the obturators vary are stored on a machine-readable recording medium, such as, a punched tape. The storage of these data may, for example, be carried out on a processor provided with printers for obtaining a graphic display of the law of variation of each parameter, of the type shown in Figure 7. At this programming stage, the data and information stored correspond to a predetermined model of the extrusion to be produced.

The recording medium is then supplied to the control and operating unit which is adapted to read the data.

The control and operating unit 30 is also provided with adjustment means 34, such as, for example, a keyboard with a respective display, which are manually operable by an operator to enable the law taken from the recording medium and representing the predetermined model of the profile to be altered from the outside. The control and operating unit processes the signal relating to the extruded length of the extrusion emitted by the encoder 28 and supplies a signal to the motor 32 to cause the displacement of the obturator members according to the aforementioned law.

During the course of the extrusion process, deviations from the desired nominal values of the parameters of the shape of the section of the extrusion produced and vulcanised are detected, for example, at the collecting section 26; it is therefore possible to operate the keyboard 34 to alter the data representing the law of variation of the parameters shown on the display associated therewith, so as to minimise the deviations of the detected values from the desired values.

The method according to the invention thus enables intervention within extremely short times to take account of the variations and deviations of the real values of the parameters from the nominal desired values, which occur during the process due, for example, to variations in the composition of the mixture of elastomeric material used or to other variables which affect the dimensions of the extrusion and cannot be predicted beforehand.

The control and operating unit may also be arranged to supply an actuating command to a marker device 36 in order for this device to mark the extruded extrusion at

a predetermined position corresponding to the length of the extrusion to be produced.

CLAIMS

1. A method for the continuous production of an extruded profile having a cross-section which varies with its length, by the use of extrusion equipment including an extrusion head provided with at least one movable member which is adapted to modify the section of the extrusion orifice to a degree which can be varied in dependence on its position, characterised in that it includes the steps of:

storing on a machine-readable recording medium data and/or information representing the laws of variation of the position of the at least one movable member of the extrusion head in dependence on the length of the extruded profile, according to a predetermined model of the profile to be produced;

providing a control and operating unit for reading information and/or data from the recording medium and causing the controlled displacement of the at least one movable member of the extrusion head according to the law read from the recording medium, the unit being provided with manual adjustment and operating means for enabling the law taken from the recording medium to be altered from the outside;

monitoring the deviations from the desired value of at least one parameter of the shape of the section of the profile produced by the extrusion head, and

operating the adjustment means in dependence on the deviations detected so as to minimise the deviations during the production stage.

2. A method for the continuous production of an extruded profile substantially as hereinbefore described.

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